

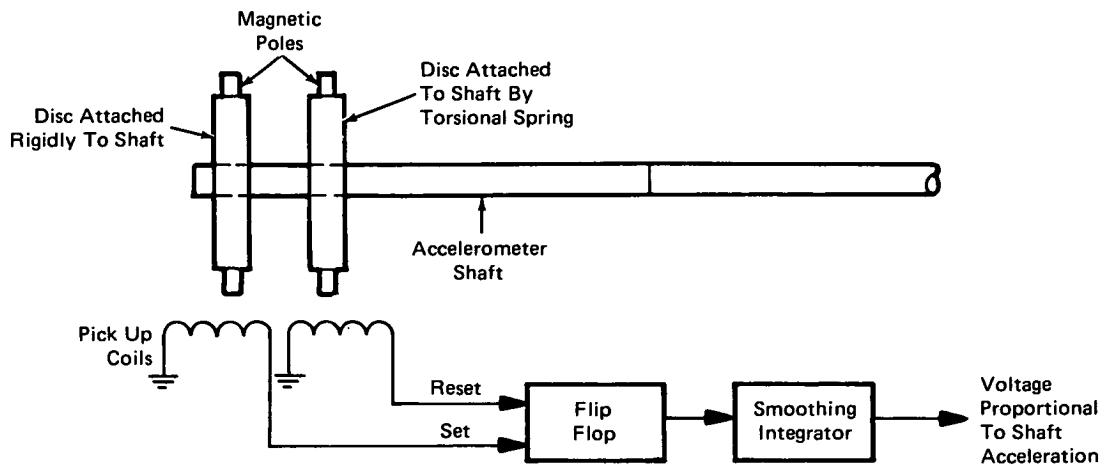
NASA TECH BRIEF

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New Motor Shaft Angular Accelerometer Concept



A new concept permits the measurement of the acceleration of continuously rotating shafts without the use of slip rings or telemetry and with little additional inertia load imposed on the motor. This concept has application in servomotor control circuits and is being considered for use in easy-to-fly airplane controls.

The design of this accelerometer involves mounting two equal diameter cylindrically shaped masses (discs), one fixed and one free, side-by-side on the motor shaft. Permanent magnet poles are mounted on the outer surface of each mass. Pickup coils, opposite the masses, are mounted in the instrument case. When the shaft turns, the magnets induce a voltage pulse into the coils. The induced voltages are fed into control circuitry to obtain a steady voltage proportional to shaft acceleration.

The device is shown schematically in the illustration. The accelerometer shaft is rigidly connected to the motor shaft. A disc is securely mounted on the accelerometer shaft and contains one or more permanent magnets. A second disc is freely mounted on the accelerometer shaft adjacent to the first disc and is

connected by a torsional spring of known spring constant. This second disc is the same diameter as the first and mounts the same number of magnets.

A case is fixed around the shaft and discs. This case contains one or more pickup coils mounted opposite each disc. A voltage pulse is induced into these coils whenever the motor shaft turns and the magnets pass under the coils. The signals from the coil adjacent to the fixed disc are fed into the set terminal, and the signals from the coil adjacent to the spring-restrained disc are fed into the reset terminal of a flip-flop circuit. The ON time of the flip-flop is proportional to the acceleration. By smoothing the flip-flop output signal through an integrator, a steady voltage is obtained which is proportional to the acceleration of the motor shaft.

The relative displacement between the fixed disc and the spring-restrained disc is dependent upon spring constant, disc inertia, and acceleration of the shaft. Since spring constant and disc inertia are known construction parameters, shaft acceleration can be determined by sensing the displacement between the two discs.

(continued overleaf)

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Langley Research Center
Mail Stop 139A
Hampton, Virginia 23665
Reference B73-10119

Patent status:

NASA has decided not to apply for a patent.

Source: F. O. Smetana of
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